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ABSTRACT

A discussion of the dominant role of English in international science and technology looks at the interplay of several factors occurring during the post-World War II period: (1) imposition of English on the post-war world by the English-speaking victors (Britain, United States, Australia, New Zealand); (2) development of the first international databases and arrival of the computer age; and (3) important change in the nature of science and technology. It is argued that while English is predominant in these fields and is influential in some communicative domains, it has had little or no effect on the personal or group identities of large populations. Several non-English-speaking societies have used different strategies to address the hegemony of English in science and technology, but the strategies have been costly and not always successful. A 1989 survey of 502 scholars in Hungary investigating language use history, patterns, and attitudes revealed that while foreign language knowledge (including English) is common among Hungarian scholars, it is less common among older scholars. Scientists tend to publish more in English than do humanists and social scientists. It is suggested that this patterns of language use puts Hungarian scholars at a disadvantage in the international scientific community. (MSE)

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The Hegemony of English in Science and Technology

Invited Paper: BAND 91 Conference

Bilingualism & National Development: Current Perspectives and Future Trends

by
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It is an honor to have been invited to address this distinguished audience, and I welcome the opportunity to speak to the issue created by the hegemony of English in certain domains and in the national development of polities in which English is not widely spoken. To some extent, the hegemony of English seems to militate against bilingualism, though I think ultimately it does not.

Why English Hegemony?

It is probably the case that most of the world shares in common an ability to function bilingually and an appreciation for bilingualism. If one scans the human population at large, it would appear that bilingualism--indeed, multilingualism--is the natural human condition, and that monolingualism is an aberrant state. But the natural bilingualism/multilingualism of the human population is periodically infringed by the rise of a monolingual power. To some extent, that was the case of the great former colonialist empires--the Greeks, the Romans, the Normans, the Arabs, the Spaniards, and the French. Leaving aside the political and economic issues for a moment, the fact is that great segments of the world's population were dominated by single languages at various times in the past and that native speakers of those single languages--largely through unconscious language planning--attempted to impose their languages on the groups they came to dominate.

The case of English is unique--indeed, each of the cases I've named was marked by particular features--great military prowess in the case of the Romans, Islam in the case of the Arabs--but the case of English is unique for several peculiar reasons: it is the most recent case, it is the most extensive case, it is a case which arose largely by accident, it is a case that has been marked by economic rather than by military expansion, and it is a case in which only certain domains and registers have come to be dominated.

The ubiquity of English is an historical accident based on several coincidences. One of those coincidences lies in the fact that the English, living on a small island, were a seafaring people and that, particularly in the 18th and 19th centuries, they succeeded in spreading their influence around the world. A second of those accidents is that the English people adopted different manifestations of Protestantism earlier in their national history; this is important because the Protestant groups hold, as a matter of faith, the idea that personal salvation can be accomplished through direct access to the Gospels which in turn implies that the Gospels must be made available to everybody and that everybody must be able to read them. Thus, one cannot ignore the im-

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portance in the spread of English of the missionary efforts of British and later of American protestant churches. (Catholic churches also engaged in missionary activity, but their ritual did not require literate participation, and their role as language disseminators was quite different. While Islam also engaged in missionary activity, Koranic literacy constitutes a somewhat different problem--one which will not be discussed here.) The notion of religious literacy is responsible for the fact that the settlers along the northeast coast of North America were perhaps the most literate colonizing population in history; among their first official acts, after basic survival was assured, was the establishment of schools for the entire population and the universal dissemination of religious literacy not only among themselves but among the Native Americans with whom they came in contact. (While I recognize the complexity of the term *literacy*, it is not possible to discuss that here either.)

But these phenomena are quite literally historical, having occurred in the more or less distant past; a more recent set of coincidences centers around the period immediately following World War II. Because Britain and the United States (and Australia and New Zealand--all English-speaking) were among the countries on the victorious side of the war, they were in a position to impose their will on the post-war settlement and on the globalism that emerged at the end of the war. That globalism coincided with the development of the first international data bases and with the arrival of the computer age. Simultaneously, there was an important change in the nature of science and technology. These several issues will be explored in some detail.

Throughout most of human history, science has advanced at a slow and stately pace. Science was, for a very long period of time, largely the province of skilled amateurs, and technological change was essentially independent of the progress of science. Most scientific innovations were a matter of accident--witness the invention of the steam engine which was at the heart of the first industrial revolution. As a consequence of the deliberate pace of scientific conceptualization and technological innovation, most human beings were for centuries able to live full, useful, and happy lives without being much bothered by changes in technology and without being much aware of science at all. But in the latter stages of the first industrial revolution, science and technology were linked together. Industrialists recognized that they needed to harness science in the service of technology; as a consequence of that recognition, a new class of professional scientists came into existence, and industry began to support science as a normal and natural function of the enhancement of profit. Industrialists began not only to support science with rhetoric but even to invest in basic science research, and subsequently (though considerably later) in scientific information. At present, for example, the pharmaceutical industry invests almost as much money in information management as it does in advertising, and as a consequence the turn-around time between scientific discovery and technological innovation has decreased from decades to days. (The turn-around time from the first scientific breakthroughs in the trans-

mission of sound through the air and the subsequent availability of commercial television was something on the order of 150 years; at the moment, there are documented cases of scientific data searches conducted electronically in a matter of hours leading to technological innovations occurring literally days later.) Furthermore, a new relationship also developed between industry and the academy, because for the first time industry was prepared to pay for basic scientific research conducted in entities which have gradually come to be known as "research universities." And in the most recent period, government has also become involved in the support of science, indirectly influencing the directions of research because of the large sums of money that government is able to invest in basic university-sited research (e.g., the famous "Manhattan Project" which produced the atomic bomb may be the most dramatic case, but the governments of the United States, Great Britain, the Soviet Union, China, Japan, Australia, and other states have directly interposed themselves into the directions of scientific research by defining the kinds of research they believed central to the national interest and therefore eligible for funding).

In the first part of the present century, the world language of science was German, but as the century progressed and Germany turned its scientific endeavor to weaponry and as it perverted its great scientific tradition with pseudo-science, English began to play a greater role in scientific development, in technological innovation, and in science information. There are some "laws" in science information; the more a group is involved in scientific innovation, the more it is likely to need science information (because the practice of science is cumulative, every innovation in science depending on the existence of prior science), and the more a group uses science information, the more it is likely to contribute to the existing pool of science information. Further, those groups who most use science information and who most frequently contribute to the pool of such information are likely to capture the global information networks for their own purposes.

At the end of World War II, the United States (essentially an English-speaking community) was the only major industrial power to emerge from the war with its scientific and educational infrastructures completely intact. For a complex variety of reasons, the U.S. scientific and educational establishments became extraordinarily productive--industry, stimulated by the war effort, needed to develop new products and new markets for its products; the U. S. assumed an official view of itself as helping the rest of the world recover from the effects of the war (e.g., the "Marshall Plan"), and the U.S. had in place vast scientific enterprizes, initially spurred by military necessity, but now ready to undertake peace-time objectives. Further, because the U. S. educational infrastructure was fully in place, the U. S. education sector became a magnet for students, particularly from the third world--a phenomenon that had the greatest implication for the emergence of new nations out of the collapse of the old colonial empires and that also had the greatest implications for the U.S. itself because over the nearly fifty years since the end of the war it has educated literally millions of the third world's youth and has enriched itself not only

through the retention of the best minds but through the invention of a new "export" commodity (education) which has brought billions of dollars in new money into the U.S. economy. These students were attracted particularly to science and engineering studies, and other nations were anxious to have their youth study in the U.S. so that those young people might return with scientific knowledge to help these nations--especially new nations--to modernize. These students have supported research not only through their tuition dollars but perhaps more importantly through their willingness to serve as cheap research labor. The cold war and Sputnik provided additional stimulus to the already extensive scientific activities of the U.S. educational and industrial sectors, and government invested even more heavily in basic research in order to maintain the national place in the cold-war competition.

At the same time, the newly created international information systems were coming on line, most of them taking advantage of recently invented electronic instrumentations. After all, the computer was, in the early 1950s, a new if somewhat ungainly toy, and its capabilities were just beginning to be understood. Under the auspices of newly emerging international governmental structures, operational rules were negotiated. English, French, and Russian were declared the official languages of science information. (Chinese was technically eligible but was not included because the state-of-the-art equipment of the time could not deal with Chinese characters, and Russian came to be used only in a limited way because Soviet science perceived a need for secrecy as a function of the cold war.) The outcome of all of this linguistic politics was that English emerged as the language of science and technology, and consequently at the present time, according to FID, something like 80 to 85 per cent of all the scientific and technical information available in the world is either abstracted in, or initially published in, English. Indeed, the extent of use of English in these domains continues to expand. But the economic domination of the United States through the middle years of the century served also to expand the use of English into other domains; as a consequence, the world language of tourism, of aircraft and maritime communication, of banking, and of business management, as well as of science and technology, is English. As the late Peter Strevens was fond of pointing out, with complete accuracy, the great majority of the world's population now uses English as a first or alternative language, and the prior colonial areas of the British Commonwealth have to a large degree retained English in the lists of their official languages. The hegemony of English is an important issue in the contemporary world. Not only is the bulk of the material stored in the world's great information storage and retrieval networks in English, but the access dictionaries are based on an English sociology of knowledge. This fact has the most important consequences, not only does it mean that one has to understand English in order to read the great bulk of scientific information, but it also means that one has to understand the Aristotelian logic and Galilean systematization underlying the English sociology of knowledge and

the English terminology of that classificatory system even in order to access the technical and scientific literature in the first place.

The English speaking nations now hold an information cartel which makes OPEC look like child's play. There are several reasons for this condition. First, petrochemical substances decrease as they are used, but information increases as it is used; second, petrochemical substances involve vast costs for exploration, exploitation, refining, and transporting, while information involves much smaller incremental costs. Although the English speaking nations control such a cartel, for most of the past fifty years they have not exercised its awesome power, perhaps out of lack of awareness that the cartel existed, perhaps out of altruism; but in the last fifteen years they have begun, in the name of national security and economic stability--that is, to protect patents, copyrights, and industrial processes--to exert real influence over the flow of information. The Reagan administration invented the term *technology hemorrhage* to characterize what was perceived to be the undesirable outflow of scientific information, at the same time failing to perceive that science can only exist in an environment in which information flows freely in all directions. That exercise of power over the flow of information has caused a perturbation in north/south relations and a continuing and justifiable demand for free access to information on the part of the neediest nations. (It has had little effect on east/west relations since the nations across that divide largely participate in the information networks, although some smaller states in the Eastern bloc were to some extent excluded from participation because their national languages are not widely spoken beyond their borders and because their access to English language instruction was severely curtailed for political reasons--a circumstance which is now rapidly changing.)

This syndrome of symptoms has characterized the conditions under which English has become the most important language in human history and has created an environment in which English has become a highly valued commodity. The value placed on the ability to use English has, in turn, created a world market for teachers of English. The People's Republic of China, for example, since it has recognized a need for English in order to achieve modernization, constitutes a potential market which could easily consume the total annual production of English language teachers from Australia, Britain, Canada, New Zealand, and the United States for the foreseeable future. The problem is that such a very large expatriot teacher population could destabilize the domestic environment (as it was in danger of doing at the time of the Tiananmen Square incident). A number of countries have sought to increase their domestic production of English teachers--that, I believe, is the case in Brunei--but the problem in this context is that locally produced English teachers may have limited knowledge of the cultural context--of the pragmatics-- of English, and such teachers often promote a local non-metropolitan variety of English, potentially increasing the distance, over time, between the international variety of English primarily used in science and technology and that local variety. This phenomenon has given rise to the spread of what

Kachru (1982) has called "nativized Englishes"--perfectly viable varieties, complete with literary production, but often limited in spread to the locality in which they arose. In these varieties, the local English serves a number of domains and takes on specialized functions somewhat different from those of the metropolitan variety. Indeed, this situation defines the price that English speakers have had to pay for the internationalization of their language. English is no longer the property of English-speakers; rather, it belongs to English users wherever they live and without reference to the "nativeness" of their use.

In the past few minutes, I have tried to suggest that the hegemony of English is an accident arising largely out of political adjustments at the end of World War II and the circumstance that those political adjustments coincided with the invention of the computer, that the circumstances underlying the spread of English have been economically driven (despite the fact that the U.S. has interfered militarily in the affairs of other states in the recent past--e.g., Vietnam, Panama, Iraq), and that the hegomony of English exists only in certain domains. In an article in *World Englishes* (1987), I attempted to compare the spread of English through the Pacific Basin with the use of Chinese throughout the Chinese diaspora in the same geographic region. The point I tried to make is that English has come to exercise an important influence in certain communicative domains but that it has had little or no effect on the personal and group identities of vast populations who remain fixed in a cultural and ethnic orientation quite independent of English.

When I talked about this topic with governmental leaders in the Philippines a decade ago, they suggested that they could simply translate all of science and technology into Tagalog. I would want to argue that such a task is virtually impossible, for a number of reasons. First, some languages will require elaboration to increase their capacities to deal with a variety of scientific and technical fields. Second, the sheer bulk of existing material and the rate of information growth is so great that, were the project to be undertaken at this moment and all available resources put to it, it would take several decades just to catch up to this moment, leaving an increasing gap. Third, even if the objective were technically feasible, the cost of achieving it would be so great that most nations simply could not afford it.

In the period since the end of World War II, three nations have devised successful strategies to deal with the problem. Japan, already a developed nation which had successfully engaged in war with the west, recognized at the end of the War that it had to have access to scientific information to recover from the devistation of the War and to take its place among the industrial states. The Japanese government, in the very late 1940s, established JIST--The Japanese Institute for Science and Technology--which procured the first computers in Japan, sent bibliographic experts to the west to learn the information storage systems, and offered its services to Japanese business and industry. The Japanese government committed a huge fraction of its GNP in the early years to the development of scientific and technical information management systems,

directed Japanese research universities to assume certain projects deemed critical to national development, and used a variety of other strategies to achieve information access. The core of its strategy was the development of an extremely effective and efficient translating system. Its success has been apparent.

Saudi Arabia adopted a quite different strategy; it took the expedient of sending a very large segment of its technocrats to the west to learn English and to study technical and scientific subjects. It created very attractive incentives to draw back substantial numbers of those who went, and it employed those trained, returned technocrats to develop its own tertiary educational sector and to assume the management of its industrial sector. It too has been markedly successful.

Taiwan represents still a third approach to the problem. Because of relationship between itself and the United States arising out of the events of World War II, Taiwan was able to negotiate a political partnership with the United States which permitted joint citizenship. This condition has permitted Chinese scientists to travel regularly across the Pacific and to participate in the information storage and retrieval system of the United States. With the advent of a variety of rapid electronic communication processes, even physical travel is no longer necessary, and access can be achieved directly through those electronic systems. (In more recent times, Israel has, to some extent, been able to emulate the successes of Taiwan in this context, although the economic development of the two states is rather different.)

It is not an accident that the few states which have been able to devise means to penetrate the great science and technology information storage and retrieval networks are not poor states. Solving the information access problem is an expensive process, and only relatively wealthy states have been able to attempt solutions. The fact remains that the states most in need of scientific and technical information are precisely the poorest states--those least likely to be able to devise viable access strategies. And, as already noted, access seems to fall out along the east/west axis; the states with the least effective access capabilities tend to lie in the southern segment of the north/south polarization.

The Hungarian Study

Let me now turn my attention to recent events in Eastern Europe. Medgyes Peter and I had an opportunity to survey the Hungarian Academy of Sciences in 1989[1]. Hungary was an ideal site for the sort of survey we undertook, partly because it is a small country with a relatively small Academy of Sciences, partly because it is a country using a "minor" language--i.e., a language not much spoken beyond the boundaries of that state.

Baldauf and Jernudd, in an article concerned with the language use among Scandinavian psychologists, expressed the notion that: "...Science consists of cooperative networks formed amongst invisible colleges of scholars..." (1987:98) and examined the role of language in scholarly communication in such cooperative networks. In other words, scientists tend not to

communicate with the general public, but rather among themselves. While, in principle, it is possible (perhaps desirable) for scientists to communicate across disciplines, in fact they tend to write for discipline-specific audiences (that is, chemists write for other chemists, not for astronomers or economists). Baldauf and Jernudd conclude that:

> The data collected strongly suggests that language poses a barrier to communication within the broad discipline of psychology, and that members of minority language groups bear most of the burden of communication imposed by language differences. The significance of this language problem may still not be readily apparent to native English speakers...(1987:114-115).

As Grabe (1984) has shown, the discourse structure of different genres even within particular sciences varies; that is, popular science is different from technical science, and both differ from such genres as textbooks and technical proposals. These differences can be attributed, at least in part, to different assumptions about audience. Scientists who write in what may be defined as a *minority* language may be said to be at a distinct disadvantage in that they can communicate only within the constrained local community of scholars but cannot reach the larger community if that community is unable (or unwilling) to read the literature in any language not generally accepted as the dominant language of disciplinary communication (e.g., a "world language"). It is a peculiarity of the contemporary world that, in many scientific disciplines, the language of wider communication happens to be English (Kaplan 1983; 1989; 1990). Detailed publication counts show not only that English is the dominant language in most scientific disciplines, but also that the hegemony of English is increasing (Baldauf 1986).

Although the indispensability of English as the international language of scientific communication has been tacitly admitted in Hungary, political obstacles have obstructed the ability to address the issue. However, in more recent times, the ice has gradually melted and, in a paper entitled "Will there be another exodus of our braincells," Vizi was allowed to assert that:

> The problems and questions that sciences address are the same for any scholar in the world, irrespective of national borders and political systems. There is no such thing as a national science...; scholars are not imprisoned in their national language: they can and must make their achievements public in international--English language--journals and books. This is the only way a scholar's work can be appreciated and, quite often, the only and most important reward he can obtain (1988: 376).

The present investigation coincided with the revolutionary changes that shook Hungary (as well as other East European countries) at the end of 1989. Consequently, while this study provides a state-of-the-art analysis of a limited segment of contemporary Hungarian society from a sociolinguistic perspective, it may be regarded as a retrospective, summary document concerning an already bygone, historical period.

The History of L2 Teaching in Hungary

Even though the notion that language-in-education planning is insufficient to spread language learning and use throughout a society has been questioned, the importance of school instruction cannot be dismissed. In order to clarify some of the problems encountered in Hungary, a brief outline history of foreign language teaching in that country over the past forty years is necessary. Prior to World War II, German was the major foreign language taught in Hungarian schools, followed by French, English, and Italian. After the Communist take-over in 1949, all foreign languages were virtually banned, except Russian, which became the compulsory foreign language in all types of schools. For forty years, every student studied Russian for eight consecutive years, and those who went on to tertiary study had an additional two years. The very low cost-effectiveness of Russian teaching was apparent from the start, as were the political motives which kept Russian in the curriculum.[2] Despite the inefficiency of the system, in 1982 the authorities pushed back the starting age for the study of Russian to nine, thereby adding a year to the length of study. Apparently, the additional year did not improve the results. Three times as many primary school children (6 to 14 years of age) had learned two foreign languages during the 1930s (Fülöp 1984). Only the *gimnázium* (secondary grammar school) offered second foreign language instruction to a relatively high proportion of the population. However, with Russian being the obligatory first foreign language, the scope of foreign-language teaching was necessarily curtailed (Medgyes 1984).

With respect to the teaching of English, the fact that in 1980 only 1.1% of all Hungarians claimed to speak English at all (*Központi Statisztikai Hivatal* 1981)[3] can be explained primarily by constraints on the school curriculum. In the 1988-89 school year, for example, less than 3% of primary school and 16.5% of secondary school students had access to instruction in English, despite the upsurge of interest in English. By comparison, in neighboring Austria (with a population smaller by 30%) more than five times as many students learned English at school (Dörnyei 1990). An additional problem lay in the restricted exposure to English (a total of approximately 350 contact hours over the four years of secondary school--a cumulative contact insufficient to produce reasonable proficiency). From the beginning of the 1970s, notwithstanding the retention of Russian as the first foreign language *de jure*, English became the first foreign language *de facto* in 1981, private and cooperative language schools were permitted to admit adult learners, who attempted by the thousands to make up for what had been lost during their formal schooling (Dörnyei and Medgyes 1987). Then, in the autumn of 1989, consonant with the dramatic changes occurring in Hungary, Russian was officially deprived of its status. Since then, it has been possible for Hungarian school children to learn any foreign language they wished, provided only that the school they were attending was able to offer that language--largely

a matter of teacher supply. It is not an exaggeration to suggest that, if English teachers were available, English would dominate the foreign language market in Hungary for years to come.

The Survey

In the Spring of 1989, with the support of the Hungarian Academy of Sciences (the major scientific body in Hungary), a questionnaire was distributed to 502 scholars; one month later, a reminder letter was sent, including a second copy of the questionnaire.[4] Of this sample, 202 respondents were Members of the Academy (that being the highest honor to which a Hungarian scholar can aspire); the remaining 300 respondents held the title Doctor of Science (*Doctor Scientiarum*). In sum, 100% of the Members of the Academy and a representative sample (25%) of the total population of Doctors of Science were invited to participate in this research.[5] In fact, 483 questionnaires reached their targets, and of these 342 (70.8%) were completed and returned. This high rate of return may be variously accounted for, but it is more interesting to speculate about the 141 questionnaires which were not returned. Beyond the obvious reasons (e.g., lack of time, distrust of surveys of this type, indifference, absence from the country, etc.) some respondents might have abstained for fear that knowledge of their poor command of languages in general and of English in particular might leak out despite the repeated assurances of anonymity in the survey. The researchers are, nevertheless, confident that the data reported below is representative of the Hungarian scholarly community.

A 22-item questionnaire was employed; it was divided into three sections:

1. General background information--4 items (1-4);
2. Foreign language competence--9 items (5-13);
3. English competence--9 items (14-22).

The majority of the items were designed for multiple-choice response; a few required minimal completion. Only three items needed elaboration. It is estimated that completion of the questionnaire required no more than thirty minutes. Seven of the items required varying degrees of introspection; consequently, the results may be viewed as somewhat subjective.[6] It is impossible to judge the accuracy of these self-evaluations because no objective language test data are available to confirm them. There is, however, evidence in the literature that self-evaluation is an accurate measure of real language proficiency (Bachman and Clark 1981). While this research project accepts the validity of self-reported data, it is necessary to interpret the results with appropriate caution.

Women represent only 4.7% of all the respondents (16 individuals); given that the number is so small, it was pointless to divide the population by gender. At the same time, the data reveal that women scholars in Hungary, while they enjoy *de jure* equality, may be at some disadvantage *de facto*. In general, the number of women in all leadership positions is disproportionately low. Age, on the other hand, does provide interesting data. There is no one in the sample

younger than 35, and only 12.4% of the population is under 50. It appears that one must reach maturity in Hungary in order to be admitted to the highest academic ranks.

The Academy fulfills its research and development functions through ten scientific sections. This sort of division appears arbitrary in at least two ways: first, it is difficult in contemporary science to demarcate disciplines, and interdisciplinary and multidisciplinary research does not lend itself to the discrete categories employed; second, there are a number of disciplines in which the membership is so small that discrete categories are impossible so these disciplines must co-exist with others in not invariably harmonious groupings.[7] In order to facilitate the needs of this study, the respondents have been regrouped into two umbrella categories, one comprising the humanities and social sciences, the other the natural sciences. The representatives of the natural sciences enjoy a comfortable majority (71.1%) over those in the humanities/social sciences (26.3%). Nine individuals (2.6%) did not respond to this item in the questionnaire.

Respondents were asked to signify their perceived foreign-language competence on a four-point scale (*low*, *medium*, *high*, and *near-native* or *native*); the average Hungarian scholar indicated a rather polyglot profile even from the international perspective. For the majority of respondents, English constitutes part of their overall foreign language competence. It can be argued that below the *high* level, one cannot communicate effectively in the language. In the present sample, 174 respondents (50.9%) possess an adequate command of English, while 20.7% of the respondents admit that they either do not speak English at all or have *low* proficiency. An average mathematician's proficiency ranges from *medium* to *high*, whereas the competence of an average historian does not reach the *medium* level. Humanities/social sciences respondents speak far more languages far better, but English occupies a disproportionately small segment of their language volume, while natural sciences respondents tend to be more English-centered but speak fewer languages (that is, they are more likely to speak English as part of their linguistic inventory--English constituting 30% of their overall foreign language competence). This is not peculiar to Hungarian scholars; English has become the universal *lingua franca* in the natural sciences, but the humanities/social sciences lag behind. It is hypothesized, however, that the gap may be wider in Hungary than in other global regions. German has the next highest frequency, probably because German was the prestige language in Eastern Europe for many years. The relatively small number of people who claim a knowledge of Russian supports the earlier contention that Russian language teaching was inefficient and ineffectual.[8]

The data show that the oldest segment of the population (65+) has the highest mean for number of languages known whereas the middle group (51-65) has the lowest, lagging only slightly behind the youngest group (35-50). Scholars who had been educated before or immediately after 1945 had a greater probability of mastering foreign languages than those educated after 1949. With respect to the relationship between age and English competence, a different

conclusion seems justified. The mean value of English language competence is significantly greater for the 35-50 age group than it is for either of the other groups, with the 65+ group having the lowest rating. These results serve to validate the conclusion that the younger a scholar is, the better his English competence is.

Respondents were asked to assess their language aptitude on a five-point scale. The mean value falls exactly between *good* and *average*. Only five scholars considered themselves *ungifted*, while thirty respondents professed that they were *very gifted* in learning foreign languages. A very high correlation was found between language aptitude and language volume. Subjects who claimed to be gifted in language learning tended to speak more languages at a higher level of proficiency while scholars who claimed to be ungifted tended to have a scanty knowledge of foreign languages.

The mean for the length of time respondents spent in English and non-English speaking countries is, respectively 7.2 and 16.7 months. Both groups (humanities/social sciences and natural sciences)have spent relatively similar total time abroad (e.g., 24.3 vs. 23.7 months) with more time spent in non-English-speaking countries. With regard to time in English-speaking countries, the difference is significant, implying that natural science respondents visited English-speaking countries more frequently than their humanities/social science colleagues. Conversely, humanities/social science respondents prefer to (and actually do) visit non-English speaking countries. There are various reasons to explain this tendency. One appears to be based in Hungarian government policy; since supporting scholars in English-speaking countries is generally more costly, Hungarian authorities have set priorities with respect to the allocation of travel grants for conference attendance. The decision as to who should be awarded the bulk of the meager resources available has traditionally been in favor of the natural sciences, on the grounds that the sciences are more likely to yield short-term benefits. One further observation: 183 respondents (53.5%) have not been to English-speaking countries for any significant time.

Next, the length of time spent in English-speaking countries was compared to age and English language competence. The results clearly suggest a tendency for the length of stay in English-speaking countries to decrease with age. To be able to interpret these data accurately, one must be aware that Hungarian scholars were virtually barred from visiting English-speaking countries in the 1950s and 1960s either as tourists or as professionals. Not surprisingly, very strong correlations were observed between time spent in English-speaking countries and the level of English proficiency. Thus, the longer one stays in an English-speaking country, the greater the English language proficiency is likely to be, and conversely the better one speaks English, the more opportunity one is likely to have to visit English-speaking countries.

Respondents were asked to indicate three major factors they believed had helped them learn foreign languages, other than extended stays in countries in which the languages being

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learned were spoken. Since this question elicited free responses, evaluation required introspection and subjectivity. Respondents were asked to rate their responses in order of importance using a three point scale. Respondents attached by far the greatest significance to conscious learning, an umbrella-term encompassing school instruction and private tutorial study as well as self-study. This is not a particularly surprizing finding, though the significance of conscious learning has been recently played down by some researchers (e.g., Krashen 1981).

.The questionnaire asked the respondents to report the total number of their publications, without specifying any detail. The average scholar published between 51 and 75 pieces in the past fifteen years, but except for indicating that the group is fairly active, the figure is not particularly revealing. The differences between respondents in the humanities/social sciences and those in the natural sciences were examined in relation to their cumulative productivity, and that difference was not found to be significant. Inquiry was made about the languages in which respondents had published; i.e., the proportion of their publications in Hungarian, in English, and in other languages. Close to 50% of all publications are in the respondents' mother tongue. The differences in the mean values between respondents in the humanities/social sciences and those in the natural sciences were explored, showing, among other things, that humanities/social science respondents published as much as three quarters of their papers in their native language as opposed to less than 10% in English. In sharp contrast, natural science respondents published over 50% of their results in English, a clear indication both of their better command of English and of the fact that, for them, publishing in English is of great importance. All respondents recognized English as the world language, and this response showed a significantly positive correlation with publishing in English, and a significantly negative correlation with publishing in Hungarian. What accounts for the relatively low proportion of English language publications among humanists/social scientists since almost unanimously the respondents claim English to be the most important language of their disciplines? One explanation is that they lack adequate writing proficiency in English; however, there is probably more to it than that.

Respondents were asked briefly to describe their preferences for alternating between Hungarian and English language publications. In their justification of the use of English language publications, a number of issues were raised. First, respondents stressed the notion that achievements in science can only reach an international audience if they are published in English language journals. (It is becoming general practice that certain Hungarian journals now accept articles written in English.) On the other hand, the respondents were rather critical of Hungarian publications, repeatedly noting that even first-rate manuscripts may have to wait years to appear. They also observed that opportunities to publish in certain fields were, in any case, disappointingly limited. Yet another argument advanced by the respondents was that in certain relatively new disciplines the Hungarian language was simply not a natural mechanism for communication.

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Nevertheless, as noted above, the language of publication for the majority of the respondents remains Hungarian. It was pointed out, however, that papers written in Hungarian differ from those written in English in several respects. For example, Hungarian-language publications often have a summative character, addressing not so much fellow professionals as university students or laymen. Alternatively, they may be inherently related either to the Hungarian language (such as articles concerned with Hungarian literature, history, or law) or to the Hungarian environment (where the research findings are intended to be used locally). Some scholars assume a nationalistic attitude when insisting that the Hungarian language is or should be made suitable for scientific communication through an abundance of Hungarian publications.

To conclude this segment of the study, the age of respondents was compared to the proportion of publications in Hungarian, in English, or in other languages. It appears that the older the scholar, the higher the proportion of Hungarian publications, and conversely, the younger the scholar, the more s/he has published in English. As noted earlier, these results can be explained by two factors: the circumstances prevailing in the recent history of Hungary, and the worldwide onslaught of English--the relative influence of these factors cannot be determined.

An attempt was made to explore the respondents' work style with regard to the language of scholarly papers; 214 respondents said that they do a first draft in Hungarian. Out of this number, 144 (67%) give the Hungarian text to a translator, while 70 (33%) translate into the target language themselves. In contrast, 218 respondents indicated that they write directly in the target language without recourse to translation.

Five options were supplied for the respondents to specify the variety of English they claim to speak: American English, British English, some other English variety, a mixture of varieties, or "Hunglish." In most European countries, British English has traditionally been the prestige variety (Medgyes 1982); however, American English is gradually becoming more widespread. Hungary is no exception to the general pattern, although certain processes have slowed down the tendency in eastern Europe.[9] The data confirm a gradual movement in the direction of American English. Within the youngest generation of scholars there is a rather high proportion of speakers of American English, whereas among the oldest respondents a relatively high proportion claim to speak British English. The middle group shows no significant deviation from the expected values. There was only one individual who claimed to speak an "other" variety--Canadian English; of the group of 41 respondents claiming to speak a mixed variety, 39 reported speaking some sort of British/American blend, one claimed to speak an amalgam of British, American, and Canadian English, and one claimed to speak a British and Indian mixture. *Hunglish* represents a non-standard variety, characterized by features common only to Hungarian speakers of English (what Kachru (1983) calls a "nativized" variety). Although only 21 (7.3%) respondents classified themselves as speaking this variety, one may speculate that some portion of those who classified

themselves as speakers of some metropolitan variety are in fact speakers of the nativized variety.[10]

The questionnaire sought to determine the age at which individuals began to learn English. The frequency results obtained from the total sample were compared to the scores of advanced English speakers (i.e., high or near-native/native levels). Those indicating that they began English study prior to the age of 18 were consistently among the advanced speakers, but the trend clearly reverses itself when the onset of English study occurred after the age of 18. These results suggest a positive relationship between the onset of instruction and the ability to achieve advanced proficiency. Conversely, the later in life one commences the study of English, the less likely the individual is to master it; those respondents whose knowledge of English was reported as poor started learning English well after the age of 18, whereas their more proficient colleagues started between the ages of 14 and 18. Respondents were asked to specify where they had studied English, marking more than one option if they wished. Self-study is the preferred way of learning, which provides additional documentation of the limited school-based opportunity to study English. A significantly greater number of scholars in the natural sciences was found to have started learning English in the family, and significantly more respondents from the science group indicated that they had taken private lessons.

Respondents were asked to rank the level of their English proficiency in various skills on a seven-point scale. The results demonstrate that, as expected, scholars marked reading in their own professional area as one of their best skills; a significantly greater number of respondents claimed to be good at technical reading than the number who indicated any other skill. Listening occurs at the bottom of the list. Significantly fewer respondents indicated listening as one of their strengths. The relative underdevelopment of the listening skill may be due to the political isolation of Hungary, on the one hand, and on the other to the employment of traditional teaching methodology, which pays little attention to listening. Given the overall higher English proficiency of the natural science group, it is no surprise that this group scored higher means across all the skill areas, with the exception of literary reading. Individuals who can, for example, write letters in English without difficulty can in all probability also converse fluently in every-day situations and demonstrate similar competence in all aspects of global proficiency.

For several decades, there were few native English speakers regularly available in Hungary. Although the number has been rapidly increasing, there is still a definite shortage. As mentioned above, the lack of native English support has indirectly impeded the development of science and research in Hungary. An average scholar came in contact with native English speakers between once or twice a month and a few times a year. The respondents from the natural sciences met native English speakers far more frequently than did their colleagues in the humanities/social sciences. Tests carried out to determine whether frequent contact with English speakers fostered

general English proficiency, listening skill, and informal speaking skill, respectively indicate a highly significant difference between the two groups (frequent vs. infrequent contact) in their mean English language proficiency; in other words, the everyday experience that the level of language proficiency is in direct proportion to the frequency of opportunities to converse with native speakers of the target language is borne out by the empirical evidence. Subjects who meet native English speakers only infrequently exhibit significantly lower mean scores than their more fortunate colleagues in both listening and informal speaking skills. The implication is that frequent contact with native speakers is likely to have a positive impact on the level of oral communication, though it is also possible that low proficiency inhibits frequent contact or even causes individuals to avoid such contact.

The opportunity for Hungarian scholars to interact with native English speakers has been observed to have been limited; the opportunity to attend conferences out of the country is even more limited. Respondents were asked to indicate the number of conferences each had attended over the past five years, citing only those conferences at which English was the official language (or one of the official languages). As expected, representatives of the natural sciences attended a great many more conferences than had representatives of the humanities/social sciences, not only in absolute terms, but relatively as well. The ratio in favor of the natural sciences reflects their clearly privileged status. The tendency may have been further strengthened by the peculiarities of Hungarian scientific life; that is to say, a Hungarian scholar was virtually barred from participation unless the organizing committee had sent him/her an official invitation declaring, among other matters, that the inviting organization would cover all applicable expenses.[11]

Information was elicited about the number of lectures delivered at international conferences. The results show that, as in the case of conference attendance, scholars in the natural sciences were far more active than their humanities/social science colleagues; the relatively high proportion may be explained in part by the fact that Hungarian scholars were rarely able to attend conferences unless they were specifically invited to give a paper. Finally, correlations were computed to see how conference attendance and lecturing related to the level of English proficiency in general, and to oral communication skills in particular. The results reveal very strong correlations across all variables. The results for the first three variables (overall English proficiency, listening skills, and informal speaking skills) imply that respondents with a good command of English were more likely to attend many conferences and give many lectures and, conversely, that the more conferences a scholar attended, the more effective his/her English skills are likely to become. It follows that the frequency of conference attendance is directly proportional to the number of English language publications. Conversely, the higher the proportion of Hungarian (and to a lesser degree, other language) publications, the smaller the number of conferences attended. It is no exaggeration to say that Hungarian scholars are caught in a vicious

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cycle; that is, one cannot hope to be invited to international conferences unless one has achieved some professional stature, but in order to achieve such international stature one must be invited to conferences. In order to enter the mainstream of international professional life, Hungarian scholars are obliged to throw off the shackles of what one respondent termed the "impenetrable Hungarian language."

This study was conducted in the last year of Stalinism; in the new environment, the kinds of changes hinted in the survey data are likely to speed up, and the situation is likely to change more in the next four years than it has in the past forty. In retrospect, it is difficult to attribute cause; is the relatively low level of English proficiency in Hungary--a level that impedes scientific innovation--the result of the recognized importance of English as the world language of science, or is it the outcome of Stalinist policies? Granted that causation is difficult to disembiguate, granted that the data reported in this study are descriptive and therefore limiting with respect to the conclusions that may be drawn, granted that conditions are changing daily in all of eastern Europe and in Hungary in particular, it remains undeniable that the issue of English language proficiency is directly tied to the condition of Hungarian science. The relative development of a nation may be gauged by the ability of that nation to access and use scientific information--a condition currently determinable in terms of the English language proficiency of scholars, information scientists, and information managers.

Summary and Conclusions

To summarize, while knowledge of foreign languages is extensive among Hungarian scholars, it appears that middle-aged scholars know fewer languages, that few Hungarian scholars know English well (if at all), that knowledge of English distributes across the population in inverse proportion to age--the older the scholar, the less likely that s/he will control English--and that the knowledge of English is tied to discipline--the humanist is less likely to know English than the natural scientist. Among those who use English, discipline specific technical reading is the skill reported most available, while the ability to understand the spoken conversational register is least available. The generalization carries over to time spent abroad--the older the scholar, the less time s/he is likely to have spent abroad--and the humanist is less likely to have had opportunities to go abroad than the natural scientist.

On the whole, the relative proportion of English-language publications is low, but scientists tend to publish more than half of their work in English while humanists and social scientists tend to publish two-thirds of their work in Hungarian. And the basic relationship continues to obtain--the older the scholar, the less likely s/he is to have published in English. This is not an accidental effect; Hungarian scholars choose the language of publication. The end result is that material published in English is intended for a professionally more relevant audience; Hungarian publications tend to have a different character and to be intended for internal

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consumption. Hungarian scholars have few opportunities to interact directly with native-speakers of English; natural scientists are in general better off because they have greater general contact and because they have enjoyed greater freedom to travel. While British English has great currency, it appears that American English is gaining ground, especially among younger scholars. The 1989 General Assembly of the Hungarian Academy of Sciences noted that:

> owing to the ever-diminishing financial resources available, science and research in Hungary are in danger of gradually falling behind the international average; should these unfavorable tendencies continue, Hungarian sciences may get into a state of irreversible backwardness (The Decisions of the 1989 General Assembly of the Hungarian Academy of Sciences. *Magyar Tudomány*. 89. 9. 759).

While the document does not specifically make reference to the language issue, it is the case that diminishing financial resources also mean a decrease in the ability to purchase journals, to access international data bases, and to train information scientists and information managers (Grabe and Kaplan 1985). It would appear that, as Hungary moves toward democratization, it will need to give attention to a national languages policy and, as a sub-set of such a policy, to a language-in-education policy, to determine what languages are key to national development, who will learn them, when they will be introduced into the curriculum, for how long they will be taught, who will teach them, and how the nation can afford to implement an appropriate policy (or whether the nation can afford not to implement an appropriate policy).

Perhaps the best summary statement comes from a comment in one of the questionnaire responses:

> The first condition of being a European scientist today is to be able to speak and read in English, German, French, and, possibly, Russian. Therefore I am dissatisfied with my foreign language competence.

The individual who wrote this comment--a meteorologist-- reported himself to have low-level proficiency in French, medium-level proficiency in Russian and German, and high-level proficiency in English. While his comment provides the best summary, the most telling comment was made by one individual who indicated that he had learned most of his English abroad--as a prisoner of war.

These data tend to suggest that the Hungarian scholar is at a disadvantage--one which is in part at least largely linguistic in origin. Hungarian is not a widely read language outside of Hungary; English is, but it is not well understood within Hungary. Thus, the Hungarian scholar is cut off at both ends from participating in the international "...cooperative networks formed amongst invisible colleges of scholars" on the basis of language.

What has been found to be the case of Hungarian scholars can, to some extent, be generalized to scholars in non-English speaking developing states around the world. It may be the case in Brunei Darussalam as well. If it is, there is a clear object lesson in these results. As Brunei

works toward the development of a national languages policy and the accompanying language-in-education policy, it must seek to serve several purposes; to preserve and enhance its indigenous languages and at the same time to permit some segment of its population to have access to the international scientific community and to other international discourse communities. These seemingly conflicting objectives can, I believe, be achieved without in any way endangering any of the languages involved, though achieving these objectives requires careful, systematic planning, adequate funding, and adequate allocations of time devoted to language study.

Thank you for allowing me the opportunity to speak at this distinguished conference. I trust you have found my comments of some interest, and I trust that the lessons underlying these comments may prove beneficial to Brunei Darussalam as it moves ahead in its own planning.

Notes:

[1]The present study was conceived and launched when the Hungarian collaborator in this study was a visiting Fulbright Scholar at the American Language Institute at the University of Southern California, in Los Angeles. The collaborators wish to express their gratitude to all the scholars who participated in the study for having completed the questionnaire. The assistance at various stages of this project of Andrea Fischer, Eszter Székács, Sarah Thurrell, and Hedvig Turai is also acknowledged. We are also indebted to Zoltán Dörnyei for his assistance with the statistical analyses and for his valuable comments on earlier drafts. We note with interest that many respondents expressed their thanks for the survey, many requested that the results be published in Hungary (they have been), and some urged the authors to develop English-language courses for scholars in Hungary or at least to publish some advice on how to learn languages more effectively. At the same time, we note that some respondents criticized various parts of the questionnaire, and that a small number rejected the notion of questionnaire research in general and of this project in particular.

[2]According to the statistics derived from the 1980 national census, a mere 1.2% claimed to speak Russian, thirty-one years after Russian was made the mandatory first foreign language in the educational system.

[3]The following is a typical joke: A foreign tourist approaches two Hungarian policemen in Budapest, asking directions.

Tourist: "Do you speak English?"
Policemen: No response
Tourist: "Sprachen sie Deutsch?"
Policemen: No response.
Tourist: "Parlez vous Francais?"
Policemen: No response.
Tourist: ["Govorite po Russke?"]
Policemen: No response.
Shrugging his shoulders in frustration, the tourist moves on.
Policeman 1: "I wish I could speak foreign languages."
Policeman 2: "What for? The tourist does, and he still can't get very far, can he?"

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[4]Only those scholars who were still active at the time of the study were invited to participate. It was simply too complex logistically to involve retired scholars.

[5]The Doctors of Science were randomly selected from the available pool.

[6]After the questionnaires had been collected, the data were computerized and subjected to analysis using the *Statistical Package for the Social Sciences (SPSS+)*

[7]For example, *Military Science, Psychology*, and *Education* have been assigned to the **Section of Philosophy and History**, whereas *Sociology* has ended up in the **Section of Economics and Law.**

[8]These data would reflect an even gloomier picture if those who had spent several years in the Soviet Union in graduate or postgraduate study were deducted from the number. It is important to note that these data represent the most highly educated sector of Hungarian society; a more general survey of the population would probably reveal an even more attenuated view of language proficiency.

[9]The aggressive marketing policies of British ELT publishers have played an important role in maintaining the dominance of British English in Hungary and, concurrently, in disseminating the British cultural value system. Events in western Europe and the emergence of an economic community in which Britain will have a role while the United States will not may over time have an impact on the greater acceptability of British English.

[10]Some odd non-technical labels specifying "Hunglishness" occurred in the responses: e.g., *uninhibited version, Budapest British, potpurri English, coursebook English, broken physicist English, etc.*

[11]Quite often, even such a letter of invitation would not guarantee permission to go; scholars' applications were flatly rejected by Hungarian authorities for purely political reasons, or they were permanently lost at some stage of the approval process.

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